IMPORTANT

GIN HOUSE ECONOMIES

LOUISVILLE, KY.:
JOHN P. MORTON & CO., 156 AND 158 MAIN STREET.
1881.

INDEX.

IMPORTANT GIN-HOUSE ECONOMIES.

Of the Proper Working of Horses in Gin Houses.

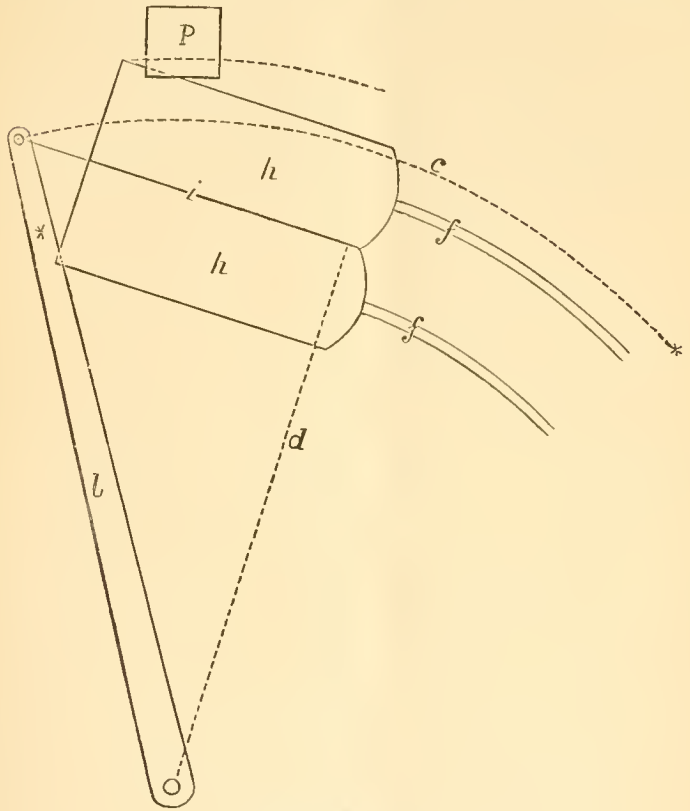

Diagram No. 1.

The letter *l* in the above diagram stands for one of the levers of a horse power. The letter *P* stands for that post of the gin house in which this diagram was made which was found to be nearest to the master wheel of the horse power. The curved line *c* stands for the line of the draught hook by which the horses were hitched to the lever. The letters *h h* represent the two horses. The letter *i* represents the line of the center of draught, while *f f* show the heads of both horses as they were found in this house walking inside the line of the draught hook.

Why were the horses in this case both walking inside the line of the draught hook? Because there was not room for the outside horse between the draught hook and the post; because the draught hooks in this gin house were put into the levers at points which made it necessary to cut notches into each of the middle posts for the passage of the swingletrees.

We will now explain the harm of throwing the outside horses thus inside the line of the draught hook.

The lever from which this diagram was made measured 14 feet from the center of the master wheel to the draught hook, and the gentleman who owned the machine thought that his horses had the advantage of 14 feet levers. He was mistaken. The full or actual lever in any horse power is the length of a line drawn at right angles to the line of draught, and extending from that line to the center of the master wheel. Look now at diagram No. 1, and observe that the line *d* is at right angles with the line *i* which is the line of draught, and then recognize that the length of this line *d* is exactly the length or value of the lever through which the power of the horses passes without loss to the master wheel. When in the case now under consideration this line was laid upon the lever, its upper end touched the point represented by the star, and a moment's measurement demonstrated that the levers fondly believed to be 14, were in reality but 12 feet in length.

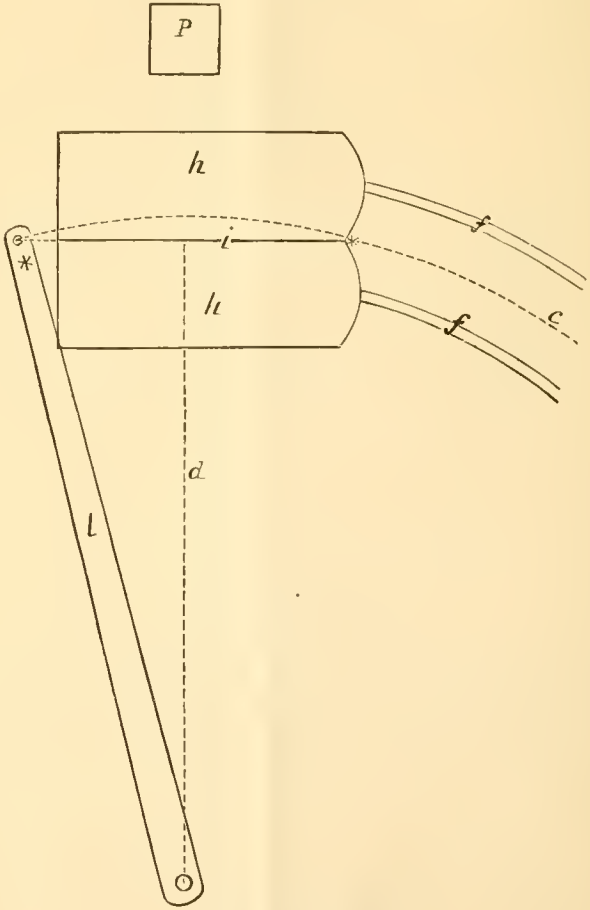

Diagram No. 2.

In diagram No. 2 also it is 14 feet from the draught hook to the center of the master wheel. But in this gin house the post *P* is some three feet farther from the center, and the head of the outer horse is therefore as far outside as the head of the inner horse is inside the line of the draught hook. Observe now the length of the line *d*. You perceive it is nearly if not quite one-seventh longer than in the first diagram. Recognize that in both diagrams it is 14 feet from the center of master wheel to draught hook, and yet in the lever under No. 2 the horses have nearly if not quite one-seventh more advantage over the weight thrown on them from the gin, than they have under their attachment at 14 feet from the center in the first gin house considered.

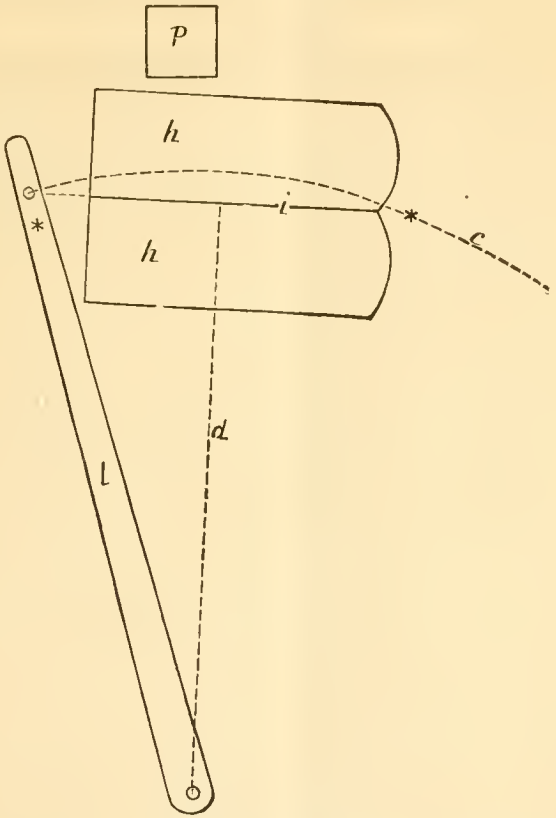

Diagram No. 3.

Diagram No. 3. was made in the gin house under diagram No. 1. In this we have, as you can perceive, moved the draught hook inward until we have but 13 instead of 14 feet to the center. When it was first suggested to the gentleman to do this, he seriously objected on the ground that he would rather nick a little farther into his posts and move his hooks outward instead of inward; but a few wise words convinced him that with the outside horses walking fairly outside the line of his draught hooks, he would have longer levers with these 13 feet from the center than, as he was at the time working, he had with them 14 feet from that center.

These diagrams are made on principles as absolute as the movements of the stars, and when by measurement you now make yourself sure that the line *d* is longer in the No. 3 than it is in the No. 1, you may rest equally as sure that with draught hooks 13 feet from the center and the outside horse on each lever walking outside the line of the hooks, any given number of horses can do the same work with less power, or do more work with the same power than they can with the draught hooks 14 feet from the center, and they walking inside that line as shown in diagram No. 1. Whatever may be the size of your gin house never therefore put a draught hook into a lever without leaving at the very least 30 inches between it and any post or other obstruction nearest to the master wheel.

Of the Wisdom of Long or Short Levers.

We will now say a few we trust wise words on the difference between long and short levers.

Horses hitched to draught hooks 12 feet from the center and walking 2½ miles an hour will make three rounds a minute; and in this case the gin saws are impelled three rounds a minute multiplied by the difference in diameter between the pinion and the master wheel, and this in turn multiplied by the difference between the pulley on the gin shaft and the pulley on the shaft with the pinion driven by the master wheel. If the difference in each of these cases be 10, the pulley on the pinion shaft will turn 3 times a minute multiplied by 10, which will be 30, and the gin saws will turn 30 times a minute multiplied by 10, which will be 300.

We will from this point proceed on the basis that to give the gin saws these 300 a minute requires a power of 600 pounds per second applied to the master wheel. For this we hitch two horses to each of two levers on draught hooks at 12 feet from the center, and if the power expended by these horses could be applied to the wheel as it is applied to the axle tree of a wagon, they would be called on but for 600 pounds per second—that is, would be called on but for 150 pounds per horse per second. But when the power of horses is expended in driving a stationary master wheel, a considerable measure of this power is dissipated before it reaches the wheel, and the measure of this dissipation may be in every case ascertained by the degree of the angle less than the right angle at which the power is transmitted to the axle tree; and on levers with draught hooks 12 feet from the center and the horses walking as in diagram No. 2, this angle will usually be found to be about 15 degrees within the right angle; and from this it can be demonstrated that an expenditure of 600 pounds per second reaches the master wheel but as about 485 pounds per second, and the result is that, as for the 300 revolutions of the gin saws the master wheel must have the full 600 pounds, the horses must supplement the amount of the loss which is 115 pounds, and so instead of 600 must expend 715 pounds per second.

We will next consider levers with draught hooks 15 feet from the center. On these the horses walking still 2½ miles per hour will make but about 2 instead of, as on the 12 foot levers, 3 rounds a minute; and as with the same master wheel and pulleys, this would reduce the motion of the saws to 225 a minute, we must, if we would preserve the 300, provide ourselves with a larger master wheel and pulley, or per-

haps only a larger master wheel or pulley, sufficient to make a compensation. It is true that to do this may cost perhaps the value of a half or perhaps the value of a whole bale of cotton; but this once invested does not have to be repeated, while the difference in the loss of power with the smaller master wheel and pulley under the 12 foot levers is repeated every second, every minute, every hour, every day, every week, every month, every year you use your running gear. But we will now see what this difference is.

With the draught hooks 15 feet from the center, the point of draught between the collars of the mules may be perhaps 12 inches closer to the draught hooks than fairly possible with the hooks 12 feet from the center, and this added to the three feet greater distance from the center, reduces the angle of loss from 15 to a little less than 12 degrees; and under this it can be demonstrated that the power dissipated is reduced to about 75 instead of, as with the 12 foot levers, 115 pounds per second; so that now instead of calling on our horses for 715 we call on them but for 675 pounds per second—a saving for four horses, pulling each but the moderate average of 150 pounds per second, of twenty-four hundred pounds per minute, one hundred and forty-four thousand pounds per hour, one million and forty-four thousand pounds per day; and if instead of two levers and four horses, we have four levers and eight horses, we have a saving of two million and eighty-eight thousand pounds per day.

You perceive now that it is on a wise and enlightened and therefore on an honest basis that we suggest a larger in preference to a smaller horse power, and that we always advise that all new gin houses be made so as to give at least 18 feet between the point intended for the center of the master wheel and any fixed post or other obstruction nearest to the master wheel.

More Particularly About Gin Houses.

A house 36 feet square inside will enable you to use levers with draught hooks 15 feet from the center, and give you three feet outside the line of the hooks for each outside horse. But recent considerations lead us to advise the form as in diagram No. 4,

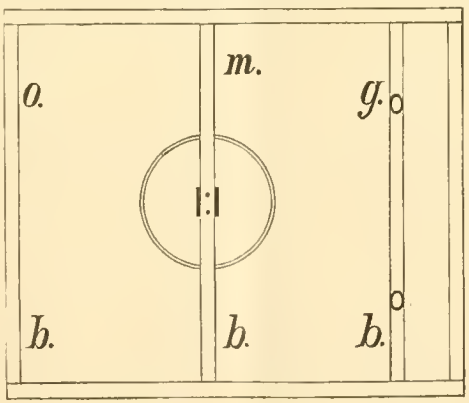

Diagram No. 4.

in which *m b* represents the middle beam of the gin stand floor supported under the center by the internal pillar of the Faught-Deering; and in which *g b* represent a gin-stand supporting beam which is the same distance from the center as the outside beam *o b*. The letters *o o* represent posts underneath for the double purpose of supporting this gin-stand beam, and for studs for a partition making a room 4 or more feet wide and 36 feet long into which the cotton seed may fall through an inclined shoot down from the gin; and this beam supported by these posts *will impart a steadiness and consequent perfection to the working of the gin not otherwise possible.* In cases in which the cotton is blown into a lint room, the gin will of course stand with its delivery side outward, and it will of course deliver in the same direction if through a condensor into a press room. But whether the delivery side of the gin be set outward or inward, its saw cylinder should be placed always as much as possible over this beam, not only for the largest possible steadiness, but also that its belt leading to the horse power may not be interfered with by the beam. Another use of this greater extension of the house on one side of the master wheel than on the other will be spoken of when we come to speak more particularly of this belt.

Our experience indicates that it is wiser not to go into details either as to modes of framing or as to any exact sizes of timbers. The model which accompanies each of our machines will give the plan of gin stand floor best suited for the support to be given it by our Faught-Deering. It will not however show this newly introduced gin-stand beam, which can be sufficiently understood from the foregoing diagram and explanation. We may say, however, that in our opinion the posts of the house will be sufficiently large eight inches square, and that the middle beam, pencil marked *M B* in model, should not be less than 8 by 10 inches, while of course the floor joist parallel with it must be of the same depth, whether 10 or 12 inches.

The parallel timbers marked *A B* in model need not, if used under fair sized floor joists, exceed 6 by 8 inches—putting the 6 inch way downward and the 8 inch way spreading over the joist. The master wheel and counter-shaft hangers to be bolted to these timbers, where you will see the holes through them in the model, have projections on their upper faces which fit in between the timbers; and for these projections (which are intended for keeping the hangers from twisting) these timbers *A* and *B* should be a little less than four inches apart.

The parallel timbers marked *C D* in model are to be sufficiently apart for the pulley of the horse power and are to be bolted at their inner ends to the middle beam by the $\frac{7}{8}$ inch bolts which accompany each machine for this purpose. We suggest that it would be perhaps wiser not to bolt up these two timbers until you have the pulley finished on the countershaft, and then put them as close to the pulley as convenient.

For our machines Nos. 2 and 4 the under surface of these parallel or hanger timbers may vary as convenient from 7 feet 6 inches to 8 feet from the level of the mule track. The internal pillars of these numbers, including the thickness of the upper plate of central hanger, and the thickness of the step or ink, are 6 feet $9\frac{1}{2}$ inches. The 7 feet 6 inches to 8 feet will therefore give from 9 to 15 inches from surface of mule track to upper face of upper foundation block.

The internal pillar of the No. 1 is six inches shorter, and of the No. 6 six inches longer than the pillars of the Nos. 2 and 4.

In a house with a second floor, as in a gin house, it costs so little additional to make the wall posts 17 or 18 rather than, as in too many old gin houses, 10 or 12 feet in height that we are bold enough to seriously advise the former. We know that some of our patrons have built houses with a floor above the gin stand floor, and we have heard from these expressions of proud satisfaction. But the importance of good head room, clear out to the walls, for the hands working on the gin stand floor, and of good light, and particularly of good light on the gin stand, should command, as we trust it will command, your serious and enlightened attention.

Of the plan of foundations, or of timbers for, or mode of roofing, or of the mode or angles of thorough bracing, we think it is unnecessary to speak, and so content ourselves with leaving these and other useful details to the good sense of yourself and carpenter. We venture, however, to suggest that you see carefully that the horse track be preserved by drains or under drains against at any time changing into a semi-quagmire, and that you make its surface high enough to bar out all possibility of overflow.

If you have ordered and received the model of our parallelogramic house, (as given in our general or advertising pamphlet), we ask you to consider the remarks made in the foregoing regarding our new gin-stand beam as wisely applicable to it also; and if building after this model you would, under those remarks, of course make your house 18x40 or 42 instead of 18x36 feet as in our general pamphlet. But in this case you would not put our central pillar under the center as it shows in the diagram in that pamphlet, but put so as to give 18 feet on one side and 22 or 24 feet on the other side of that pillar. The 4 or 6 feet difference being for the very useful cotton seed reception room and the gin-stand supporting beam and posts.

Of The Gin.

A cotton gin is a machine of quick and subtile operation and should have a more earnest watchfulness and a more intelligent supervision than it has thus far generally received. As men of many quiet observations, we respectfully declare that did machinery in general receive no better attention than on an average it receives, or at least has thus far received in our gin houses, there never would have been and there never could be a successful manufacturer of any commodity through machinery in the world; but as men who have not simply an admiration of machinery, but a love for the grand ultimates which under God are in fair time to be attained through it, we have full faith that the diffidence or thoughtlessness which has caused or still causes this absence of right attention to the foundations for, the light upon and the right running of our gins will in the course of a very few generations disappear.

One gentleman of celebrity as an expert under cotton machinery, says that our common saw gin is barbarous, and hopes, as we also hope, that the time is coming when the lint will be taken from the seed by something more gentle than rigid rapidly flying claws of steel; but we are sure, and we think he also is sure that the time will never come when this benignant staple can be separated from the seed by other

than fine and subtile appliances, and therefore the time will never come when fine and intelligent attention can not be of importance under this separation. Indeed we almost believe that were our common gins to day receiving the attention necessary to bring out their best capabilities, we could even now be given a gin which the gentleman alluded to would not call barbarous. Some five years ago we examined a gin with a capacity of, we think, six bales a day which was much gentler in its handling of the fiber than our saw gin; but at the same time we perceived that however wise this machine was in design, it was too nice in mechanism and movement to allow us to think that, in our ordinary gin houses, and particularly under the condition in which seed cotton is now delivered at these houses, it could be, at least during the decade in which we then were, in any general way successful. But we again express our faith that the time is fairly approaching when machinery in our gin houses will be set and cared for and manipulated with the enlightened attention given to machinery in a well ordered cotton factory, and then, and in but a limited degree until then, wise mechanicians may realize that they can make themselves useful through gin houses in at least a measure of the degree in which during the past fifty years they have made themselves useful in cotton machinery other than gins.

The goodness of a gin made at this time by any of our established gin makers depends, we think, less on difference in subtilty of detail than on thorough workmanship and material. We have however recently examined a gin which, in the class now under consideration, namely the common saw gin, promises perhaps an advance. It is known that under a heavy pressure of work and speed the belt that drives the gin brush sometimes slips, and when this happens it is easy to conceive that the saws are not duly stripped of the lint; and as in this case the lint is again carried into the gin-breast, the consequence is necessarily a diminished product and a heavier weight on the horses or the engine. To bar out these evils, the belt and pulleys in the gin in question were removed, and their places supplied by gearing. Given that the revolution of the brush is four times that of the saws, it follows that a pinion of $4\frac{1}{2}$ inches diameter on the saw, and a wheel of 18 inches ditto on the brush shaft will preserve these proportions; and with this gearing there can be no interruption to the due relative revolution of the brush. In the case in question the cogs of the wheel were of hard maple, and it may therefore be presumed that the usual noise of gearing was reduced to a minimum not particularly offensive. There is no doubt in our minds under either of two points; *first* if this necessarily short belt be drawn sufficiently taut to bar slipping under high weights and speeds, there inevitably follows a considerable loss of power*, and if to bar this loss the belt be run a little slacker, there must as inevitably ensue a slipping and its equally as bad consequences. It is possible that under these facts, gearing may have been adopted at some earlier day, and perhaps owing to an ignorance which charged a failure from bad workmanship to a supposed failure from the design, the plan was abandoned. But if the design is good, and we believe it is, we have reason to feel assured that it will not be again abandoned.

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*This will be more particularly spoken of in our section "Of The Belt."

Proving the Condition of the Gin.

This is a work which should be done faithfully every noontime. You may see that it is doing its work fairly and may naturally think that this is all that is necessary; but what seamstress does not know that though her sewing machine makes its stitches this morning as perfect as its stitches of yesterday, it may nevertheless call on her today for twice the power it required yesterday? Add to this the fact that machines which first handle any substance are more liable to derangement than those which handle the substance afterward; the cotton gin is one of these first or prime manipulators, and we have in this fact an additional reason why it should have a careful daily examination.

To do this take the belt off the pulley of the horse or steam power and hook it back clear of the gin pulley; then, having previously been careful to have an empty gin-breast and oiled journal boxes, put the face of your open hand on the pulley and if it moves once full round under a reasonable pressure of the hand, you may conclude that, at least in the absence of any mal-working which might be developed only under full operation, the machine works sufficiently easily. If however it does not turn under this fair pressure of the hand, you should take off the belt brush and try first the saw and then the brush cylinder, and keep on trying until you discover and remove any obstruction which hinders you from turning its entire machinery with the face of one of your hands on its driving pulley.

We were told some time ago by two of the oldest and if not the very best at least among the very best, gin-makers in the country, that if a gin be properly constructed and in good condition, it will do its maximum of work with its saws an inch and an eighth at their highest point through the grate-bars If this be so—and we have no good reason to think otherwise—then very many run their saws too deeply into the roll, and thus uselessly put heavier burdens on their mules.

You will of course see that the saws run always exactly in the centers of the spaces between the grate-bars; and by proper examinations keep yourself sure that your gin is all right in places where the eye can not reach it, as well as externally where it is more readily under your observation. If the grate-bars wear unduly at the points where the saws take the cotton through them to the brush, or if there is any obstruction against the easy removal of the lint from the teeth of the saws, or to its free passage or delivery into the lint-room, you should at once conclude that there is something wrong, and work earnestly for its removal.

Of the Speed of the Gin.

To ascertain this, you have but to divide the diameter of the pulley on the horse power by the diameter of the pulley on the gin stand, and then multiply the quotient by the number of turns made by the former during one minute's travel of the horses.

Thus the diameter of the pulley on our No. 4 Faught-Deering is 112 inches; suppose then that the diameter of your gin pulley is 8 inches, we say 8 into 112 goes 14 times. At the rate of 2 rounds a minute of the mules, the pulley on this No. 4 will turn 22 times a minute, and we therefore multiply the quotient 14 by 22, which gives us 315, which in this case will be the revolution per minute of your gin saws.

If at any time you think that the speed of the saws is too high to be fairly borne up under by the number of horses you are using, you can make the gin-stand pulley a little larger, or, if you can do so without interference with full room for the outside horses outside the line of the draught hooks, you can put the horses farther from the center, and so by the greater time required for their round, decrease the speed of the gin, and by the same act give them also the advantage of longer levers.

If at any time, on the other hand, you think your horses can in any particular case fairly give a higher speed to the saws, you can give them a trial under this by decreasing the diameter of the pulley on the gin stand, or by moving them with the draught hooks closer to the center.

If under any change of this kind any one is in any way in doubt, we invite him to write to our Secretary, who will as immediately as cheerfully respond with full answers as may be desired. And our experience under this part of our subject leads us to request that any such letters carefully give accurate information on each of the following points:

First. Give the distance from the center of the master wheel to the draught hooks.

Second. Give the distance from the draught hooks to the post or other obstruction nearest to the master wheel.

Third. Give the distance between the center of the pulley on the power and the center of the pulley on the gin.

Fourth. Give the diameter of each of these pulleys, also the number of cogs in your pinion and the number of cogs in your master wheel.

Fifth. Give the width and character and running of the belt. We mean by character, whether it is ragged and patched, or smooth and unbroken; and we mean by the running, whether it runs with or without an idler, and whether it touches any board or timber at any point of its passage between the gin and the power.

Sixth. Give the number of mules, horses or oxen you are using and the number and diameter of the saws of your gin stand.

Seventh. Give as nearly as you can the times, whether only 2, or $2\frac{1}{4}$, or $2\frac{1}{3}$, or $2\frac{1}{2}$, or $2\frac{3}{4}$, or 3 rounds a minute that are usually made by your mules, horses or oxen.

On the receipt of a letter giving plain and full information on each of these points we are quite sure that our Secretary can in any case of doubt or difficulty guide you into disembarrassment and satisfaction.

Of the difference between 10 and 12 inch gin saws, we deem it wise to quote in this the following from our advertising pamphlet:

The speed of a 12 inch saw at 250 a minute is equivalent to the speed of a 10 inch at 300 a minute. If 4 mules, pulling not unduly, can run a gin with fifty 10 inch saws at 300 a minute, they can not, with the same pulling, run a gin with fifty 12 inch saws at 300 a minute; because in the latter case the number of saw teeth which will pass through the cotton will be at least fifteen thousand more a minute than passed through it in the first case; and it must therefore be expected that this greater work will call for a greater power. This being recognized it may be deemed probable that the speeds named in the foregoing paragraphs may prove too high for gins with 12 inch saws; but should this ever prove so, the matter can be easily adjusted by a little

lagging up of the pulleys on the saw shafts, as may on experience be found advisable. Much trouble will in many cases be avoided if it be borne in mind that gins with 12 inch saws can not be run by any given number of mules at the same revolutions per minute at which these mules can run the same number of saws of 10 inches in diameter.

Of the Belt Leading from the Gin to the Power.

The belt for a 50 saw gin should be 8 inches wide, and for gins of 60 or 70 saws should be 9 inches, while for gins of 80 saws it should be 10 inches wide.

Some may think that these measures are wider than necessary, and we will now therefore explain the wisdom of these widths.

A few years ago a manufacturer of our acquaintance, after just passing through a fire which destroyed his works, put a piece of shafting into a lathe to be turned by man power. Some half hour after giving the order he passed into the temporary shed in which this was being done, and found the machinist turning off about a sixteenth of an inch at a cut—the shaft being 2¼ inches in diameter. He said: John, that will take too much time. You should take off a deeper cut. Sir, I can't, the machinist answered. It is all Jim can do to cut this sixteenth.

The manufacturer took hold of the crank and after a few turns demonstrated for himself that John was right. The driving pulley turned by a crank in the hands of a laborer was about seven feet distant from the pulley of the lathe, and the belt was therefore necessarily nearly as taut as a fiddle string.

He said: Mr. Machinist, move this frame with its pulley and crank shaft five or six feet farther from the lathe, and with a belt that much longer, try what Jim can do.

This was done, the belt was run considerably slacker, and Jim then turned off an eighth of an inch almost as easily as before he had turned the sixteenth.

John, said the manufacturer, take off this 3 and put on a 4 inch wide belt and let us see the result.

This done, the belt was slackened, as then it could be slackened, still a little more, and Jim whistled and John sang on finding that now it took less power to turn a cut off the iron an eighth of an inch in depth than it had before taken to cut off the sixteenth.

Under this demonstration you will perceive the importance of two things: *first* a good wide belt and *second* a good long belt; and under this latter you will we trust realize the great usefulness of the additional four or six feet which under diagram No. 4 we have advised to be added to the gin house on that side of the horse power intended for the gin stand.

We must not close this section however, without earnestly advising that you never, if you can possibly avoid it, use a belt binder or idler; and be careful that the belt, on its passage from the pulley on the power to the pulley on the gin, does not touch, either on edges or faces, any thing but God's air.

If your gin house be an old one in which it seems impossible to put the gin at a due distance from the power, we suggest that you frame up two or three posts four or six feet from the outside of that end of the house at which you have your gin stand, and on these frame a floor on

which you can move the gin outward until its saw cylinder stands over the wall beam; then put a roof, dormer fashion, over this projection. Two or three days' labor by a resolute workman will enable you to move off the gin and secure the very great benefits of the longer belt.

Conclusion.

We sometimes have letters from correspondents who having old or bad, or perhaps old and bad machinery in bad juxtapositions in bad gin houses, say they gin an average of but half a bale per mule per day; and our answer is that with gin and power set and run, as for the best interests of the purchaser, advised in this pamphlet, we can offer a guarantee of 600 pounds per mule per day.

In conclusion, we respectfully commend to your consideration three questions, each to be answered in the light of all the foregoing:

First. Is it wise to continue any longer than it is possible to discontinue the use of bad running gear badly connected with the gin in a bad gin house?

Second. In the light of the fact that two mules have abundant power to gin 600 pounds of cotton in five hours, is it wise to send these mules with this cotton, weighing in the seed 1500 pounds, one, two or perhaps more miles, to be returned to you minus one tenth or one twelfth for ginning, and minus also the more or less inevitable loss in going to and passing through a gin house not your own, or in any controlling sense not under your supervision?

Third. In the face of the fact that eight fair mules, horses or oxen have abundant power, working ten hours a day, to gin 600 bales in 90 days (and is not a rest of ten days as good for the animals as an idleness of three months) is it wise to subject yourself to the solicitude, indeed perhaps the strain and inquietude attending the use of steam power?

In things of this kind we refrain from trying to exercise any influence other than through an unfolding of facts, and beyond the simple demonstrations we have given, we therefore leave these questions to be answered by your own judgment.

In justice to ourselves we should add, however, that we purpose, as soon as we have secured certain desirable simplicities, to manufacture steam engines; and we add to this that, as between steam power, as thus far developed, and mule, horse or ox power for gin-houses, we shall say then exactly as we say now, namely that, in our generation at least, mule, horse or ox power may be made on a very large majority of our plantations, all things considered, preferable to steam power.

As soon as we have secured these wise simplicities to which we have alluded and begin to make steam engines, we shall add to this pamphlet a supplement with our best suggestions for gin houses for steam power.

Faught-Deering Cotton Gin Driver Manufacturing Company.

WILLIAM DEERING, Sec'y.

LOUISVILLE, KY., 1881.